A.D. 1852 . . . . . N° 13,974.

SPECIFICATION

OF

WILLIAM EDWARD NEWTON.

MANUFACTURE OF COKE, &c.

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NEWTON'S SPECIFICATION.

TO ALL TO WHOM THESE PRESENTS SHALL COME, I, William Edward Newton, for the Office of Patents, 66, Chancery Lane, in the County of Middlesex, Civil Engineer, send greeting.

WHEREAS Her present most Excellent Majesty Queen Victoria, by Her Royal Letters Patent under the Great Seal of Great Britain, bearing date at Westminster, the Twenty-third day of February, in the fifteenth year of Her reign, did, for Herself, Her heirs and successors, give and grant unto me, the said William Edward Newton, Her especial license, full power, sole privilege and authority, that I, the said William Edward Newton, my exors, admors, and assigns, and such others as I, the said William Edward Newton, my exors, admors, or assigns, should at any time agree with, and no others, from time to time and at all times during the term of years therein mentioned, should and lawfully might make, use, exercise, and vend, within England, Wales, and the Town of Berwick-upon-Tweed, my Invention of "**Improvements in the Manufacture of Coke, and in the Application of the Gaseous Products arising therefrom to Useful Purposes**;" in which said Letters Patent is contained a proviso obliging me, the said William Edward Newton, by an instrument in writing under my hand and seal, particularly to describe and ascertain the nature of my said Invention, and in what manner the same is to be performed, and to cause the same to be inrolled in Her Majesty's High Court of Chancery

within six calendar months next and immediately after the date of the said in part recited Letters Patent, as in and by the same, reference being thereunto had, will more fully and at large appear.

NOW KNOW YE, that in compliance with the said proviso, I, the said William Edward Newton, do hereby declare that the nature of the said Invention, and the manner in which the same is to be performed, is particularly described and ascertained in and by the following description thereof, reference being had to the Drawings hereunto annexed, and to the letters and figures marked thereon (that is to say):—

In the distillation of the coal for the purpose of obtaining gas for illumination, carbonate and hydrosulphate of ammonia are evolved, but are not usefully employed, the only products that are preserved being the carburetted hydrogen which comes over with the ammonia, and the coke which remains in the retort. In the ordinary process of manufacturing coke for locomotive engines and other purposes, where a superior quality of coke is required, all these gaseous products are wasted, as it has hitherto been found necessary to burn the coal in open coke opens or chambers which are only partially closed, an aperture being left to allow the smoke and gaseous products to escape, and air to support combustion is, during a certain portion of the operation, allowed to enter through small orifices provided for the purpose. By these means, which are well known, a dense coke of very superior quality is produced when the process is properly conducted, but the gaseous products which are evolved during the coking process are usually allowed to escape into the atmosphere, and are lost. As it is well known that the waste gaseous products evolved during the combustion of coal, or the manufacture of coke or coal gas for illumination, contain ammonia, carburetted hydrogen, and other valuable matters, various plans have been from time to time devised for obtaining and advantageously employing the ammonia and other gaseous products evolved during the combustion of coal and the manufacture of gas or coke; it has, however, been found that in the apparatus or processes hitherto employed for this purpose, although considerable quantities of ammonia were obtained, yet the coke produced by the process was much inferior to that made in the ordinary open coke oven. This arose from the fact that in order more effectually to obtain the whole of the gaseous products the ovens or retorts were closed, and, by applying the heat below, a distilling operation was carried on; whereas a totally different process takes place in the ordinary open coke oven. As the coke is, for the reason before mentioned, greatly deteriorated in quality, the value of the process is diminished in a corresponding degree, and, in fact, commercially speaking, the process, as far as regards obtaining chemical products, such as

the salts of ammonia, has been found practically useless. Up to the present time, therefore, it has been considered preferable to adopt one process for the manufacture of good coke, and another one for obtaining the gaseous products from coal. It seems to be a sine qua non that to obtain good coke the oven should not be closed, and the process must in no degree resemble a distilling operation. The object of the present Invention, therefore, is to take the gaseous products that arise from the coal during the manufacture of coke in the ordinary way, and extract therefrom all the valuable matters they contain. If this can be done without deteriorating the quality of the coke the gross value of these products (which are now wasted) becomes a saving of considerable amount, as the cost of collecting the products is comparatively very trifling.

The improved process consists in bringing the gases which are evolved during the combustion of coal or during its calcination in an open chamber, and particularly in coke ovens, into contact with water, acids, salts, and, in fact, any substances which are known to combine with or absorb ammonia; also in the employment of a pump or aspirator when the draft is insufficient. When there is sufficient draft, a vessel or receptacle containing any of the substances which will absorbe the ammonia is adapted to the flues or chimney through which the gases escape, and through which receptacle the products of combustion are made to pass, and the substance contained therein will retain the carbonate and hydrosulphate of ammonia. In order to impede the draft as little as possible, the substance contained in the said receptacle is either placed upon a kind of sieve or strainer, such as are usually employed in apparatus for purifying gas for illumination, or an apparatus for showering the water down is employed, or any other apparatus having interstices for the passage of liquids and gases will answer the purpose. When the draft is insufficient (and this is generally found to be the case) an apparatus is employed, consisting, firstly, of a flue which receives the gas on its exit from the fireplace or oven; second, of a receiver, in which the gases are conducted by means of the flue above mentioned, and brought into contact with some substance capable of retaining the ammonia; and, thirdly, of a blower, ventilator, or other convenient means for the purpose of creating a draft. Any apparatus capable of driving or drawing off the gases may be employed for this purpose.

The following apparatus are also employed as accessories (viz^{t}):—First, a refrigeratory apparatus of some kind for the purpose of refrigerating or cooling the gases, and causing them to deposit the soot produced by the condensation of the smoke. Secondly, a vessel placed before the one for the reception of the ammonia, and in which the tar and lamp black are deposited. Thirdly, a pipe

for carrying off (from the vessel in which the ammonia is separated from the other gases) the uncombined and combustible gases, such as the carburetted or sulphuretted hydrogen, and by which pipe they may be conducted to jets or burners under the apparatus employed for the concentration of the ammoniacal salts, or under the subliming apparatus, or the steam boiler, where the heat generated by the combustion of these gases may be usefully employed. These combustible gases may be, by means of branch pipes and jets or burners, distributed under any other apparatus, where they may be consumed.

Having explained the principle upon which the present improvements are based, and the object which they are intended to produce, I will now proceed to explain more in detail the construction, arrangements, and operation of the apparatus, whereby the results above mentioned are obtained. In the accompanying Drawings I have shewn the best means with which I am at present acquainted for carrying out the improvements. In Sheet I. the entire apparatus is represented drawn to a scale of one twentieth the real size, Fig. 1 being an elevation of the apparatus, Fig. 2 a plan, and Fig. 3 an end view of the same. A, A, A, are the coking ovens, of which there may be any convenient number (say twenty). They are similar in construction to those usually employed in England. a, a, a, are the supply and discharge apertures, serving also for the admission of air. a^1, a^1, a^1, are short vertical flues proceeding from the ovens, and terminating in the horizontal flue B, which is about sixteen inches wide by twenty inches in depth. Coke ovens in England are sometimes provided with a similar flue, which usually conveys the gaseous products to the chimney shaft, and from thence into the atmosphere, but it may be employed for conveying the gases to the apparatus hereafter described. Of course where a horizontal flue of this kind does not exist it must be constructed for the purpose of carrying out the present improvements. This flue should be formed of two small walls b, b, with a roof b^1, constructed of brickwork or masonry (see Fig. 4, which represents a section of the flue), or it may be covered with large slabs of firebrick, which would enable the processes of cleaning and repairing to be conducted with facility. In order to economize the heat in this flue the boiler of a steam engine may, if required, be mounted thereon, or the heat in this flue may be applied to the vessels for the concentration of the salts, or vessels for the calcination of the soot, or the subliming apparatus (if hydrochlorate of ammonia were desired to be produced) may be adapted thereto. Into this horizontal flue B the chimney of each oven a^1 leads, as above mentioned, and shewn more clearly at Fig. 5, Sheet II. The flue B discharges the gases and other products into the chamber C, which is constructed of brickwork or

masonry, and is closed as hermetically as possible. It is intended to contain the refrigerator D, shewn detached at Figures 7, 8, and 9, Sheet II. The position of this refrigerator in the chamber C is seen by dots in Figures 1 and 2, Sheet I. *c*, *c*, *c*, Figure 1, are openings made at the lower part of the chamber C for the purpose of cleansing it and discharging the lamp black or soot which is deposited on the bottom of the chamber. The direction of the gaseous products of combustion through the apparatus is shown by the arrows in Fig. 1, 2, and 5. c^1 is a partition for supporting the refrigerator D, but leaving openings c^6 (see Figures 5 and 5*) for the passage of the gases. Upon this partition is a cast-iron bar c^3, with a groove or channel in which the plates or flanges of the refrigerator rest, and forming a partition extending from the bar c^3 to the top of the chamber. The only passages open for the gases are under this bar c^3. c^2 is also a wall built in the same manner as c^1 upon the bed of the chamber C, but forming a partition with the supports of the refrigerator, the flanges of which take into and rest upon the bar c^4. The openings for the escape of the gases are at c^7 above; the gases following the direction of the arrows pass through the pipe c^5 into the vessel E. This vessel is made either of freestone or lead, or some other material lined with freestone or lead. This vessel consists of several parts well luted together. Upon the false bottom *e*, which is pierced with holes (see Figures 5 and 6), are piled up to the top very hard pieces of coke or freestone or pumice stone, or any other substance which is not affected by the action of sulphuric acid, and which by reason of their irregular form will have interstices left between them. The acid diluted with water is placed in the vessel F, which is made of lead or freestone. The water is allowed to flow into the vessel E through the pipe *f*, which is furnished with a stopcock to regulate its flow. The dilute acid will fall from the vessel F in a shower on to the pieces of coke or freestone contained in the vessel E, and when percolating through or between these substances it will meet in its passage with the gases which are made to pass from the pipe c^5 through the vessel in a contrary direction. The uncombined gases which remain will make their exit through the pipe e^2 and pass onward to the ventilator H, Figures 1, 2, and 3. By this arrangement the working of the apparatus will be rendered continuous and will cause a very large contact surface of gas and acid. The acid descending drop by drop and becoming constantly more divided will meet with gases more or less rich in ammonia, which it will take up or absorb, and will arrive in a saturated state in the lower part of the vessel E. When this part of the vessel E has been filled up to the level e^1 the saturated solution will flow through the syphon pipe e^3 into the leaden vessel G (Figures 1, 2, and 3),

from whence the solution will pass into the concentrating apparatus. H is a centrifugal or other ventilator for increasiug the draft. It has not been deemed necessary to give a detailed Drawing of this part of the apparatus, as its construction is well known. Any other kind of exhausting apparatus may, however, if desired, be employed instead of the ventilator or fan H; for instance, jets of steam suddenly condensed in a chamber connected with the vessel E will have the effect of creating partial vacuum therein, and will draw the gaseous products through the apparatus. The ventilator will draw off the uncombined gases from the upper part of the vessel E through the pipe e^2, and force them through the pipe I, by which they will be conveyed away, and as they will be found to consist for the most part of combustible gases, such as carburetted or sulphuretted hydrogen, they may be conducted under the concentrating boiler or evaporating vessels, and employed as fuel for heating and concentrating the liquid salts of ammonia which have been produced in the vessel E. The pipe e^2 is continued a little lower than the entrance of the ventilator in order to allow the condensable matters which may be disengaged to be collected in this prolonged part, which is furnished with a discharge cock, as seen best in Fig. 3.

Figures 7, 8, and 9 (Sheet II.), represent detached views of the refrigerator, drawn to a scale of one tenth the real size. It will be understood that unless the temperature of the gas is reduced, large quantities of carbonaceous matter in the form of smoke would pass into the apparatus, but by reducing the temperature of the gases, the smoke will be condensed and made to deposit in the form of soot in the refrigerator, from whence it may be removed through the openings c, c; but if the gaseous products highly charged with carbonaceous matter as given off from the ovens were allowed to pass through the pipes of the refrigerator, the pipes would quickly become clogged with soot and thereby greatly obstruct the working of the apparatus; it is therefore indispensable to cause the refrigerating water to pass through the pipes instead of the gases, which become cooled by coming in contact with the cold surfaces of the pipes. The refrigerator is composed of a series of flanged pipes of cast iron, which must not exceed three eighths of an inch in thickness, set one above the other in the chamber C (Sheet I.) There are only two kinds of pipes, the curved ones d^3, furnished with circular flanges, and straight ones d^4, furnished with rectangular flanges, which by being bolted together form partitions, dividing the chamber C into three parts, d, d^1, d^2. The gases pass from the flue or chimney B down into the part d, where they are cooled by passing between the curved pipes, and deposit the lamp black or soot at the bottom, passing thence through the opening c^7 into the part d^2, from whence,

after having come in contact with the curved pipes, they flow off through the pipe c^5 into the vessel E. The refrigerating water enters the pipes at d^5 below, and after having run through the whole series of pipes will pass off by the opening above, to be afterwards employed for quenching the coke supplying the engine, or for any other useful purpose. This arrangement of the refrigerator possesses also the important advantage that it can be enlarged, or reduced in capacity without deranging any part of the apparatus, and almost without interfering with its working. Ten rows of pipes of the dimensions given, which will enter the chamber C, will give a surface of about one hundred and twenty-five square yards, which will be more than sufficient for the working of the apparatus.

It has not been deemed necessary to furnish Drawings of the steam engine for working the ventilator and supplying the refrigerator with water, &c., or of the concentrating vessel, these parts being independent of the apparatus, and their construction being perfectly well known. I would observe that the apparatus must be furnished at various parts with stopcocks and doors to extract or remove the various products as they accumulate. I would also remark, that although I have above set forth and described the best arrangement and construction of apparatus with which I am at present acquainted, I do not intend to confine myself rigidly to the arrangement herein shewn and described, as it may doubtless be varied without departing from the nature and object of the present Invention; nor do I intend to claim the exclusive right to produce ammoniacal salts from the gas evolved during the combustion or distillation of coal, as I am aware that this object has heretofore been effected; but that which I consider to be new in the process above set forth, and therefore with to claim as the Invention secured to me by the hereinbefore in part recited Letters Patent, is, the adaptation to ordinary coke ovens of an apparatus whereby the gaseous products evolved during the combustion of coal therein may, without interfering with the ordinary process of coking, be drawn off and conveyed away to a receptacle or chamber where they may be separated from each other, and combined with other chemical agents, to form valuable products, or used for some other useful purposes, as above described.

In witness whereof, I, the said William Edward Newton, have hereunto set my hand and seal, this Twenty-third day of August, in the year of our Lord One thousand eight hundred and fifty-two.

W. E. (L.S.) NEWTON.

Newton's Improvements in the Manufacture of Coke, &c.

CROSBY.

AND BE IT REMEMBERED, that on the Twenty-third day of August, in the year of our Lord 1852, the aforesaid William Edward Newton came before our said Lady the Queen in Her Chancery, and acknowledged the Specification aforesaid, and all and every thing therein contained and specified, in form above written. And also the Specification aforesaid was stamped according to the tenor of the Statute made for that purpose.

Enrolled the Twenty-third day of August, in the year of our Lord One thousand eight hundred and fifty-two.

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Printers to the Queen's most Excellent Majesty. 1857.

FIG . 2.

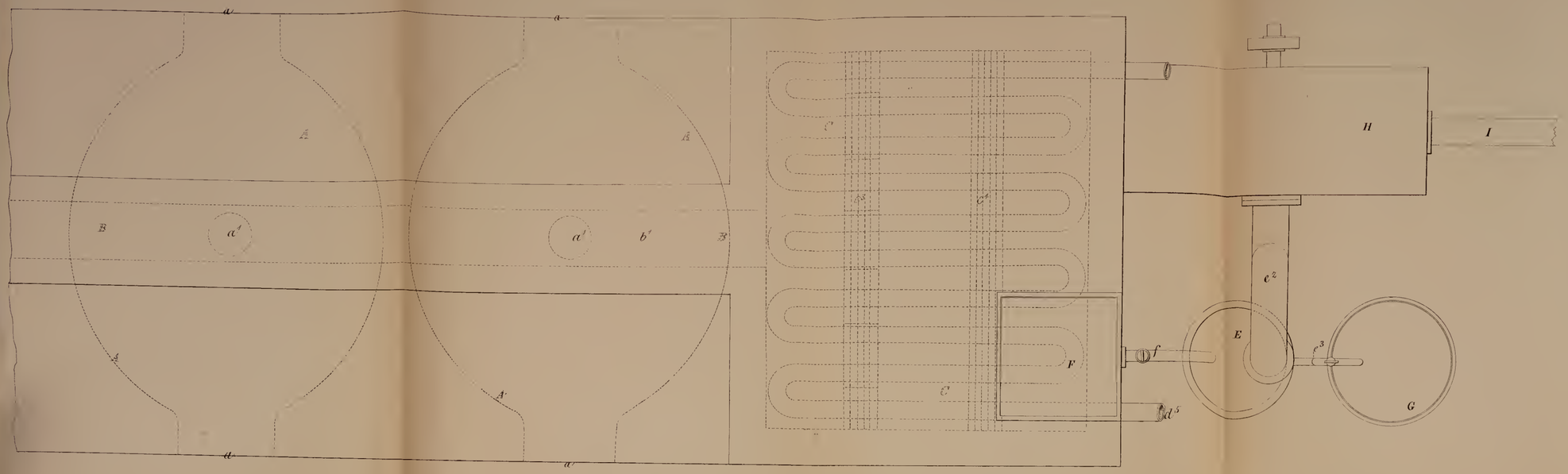


FIG . 1.

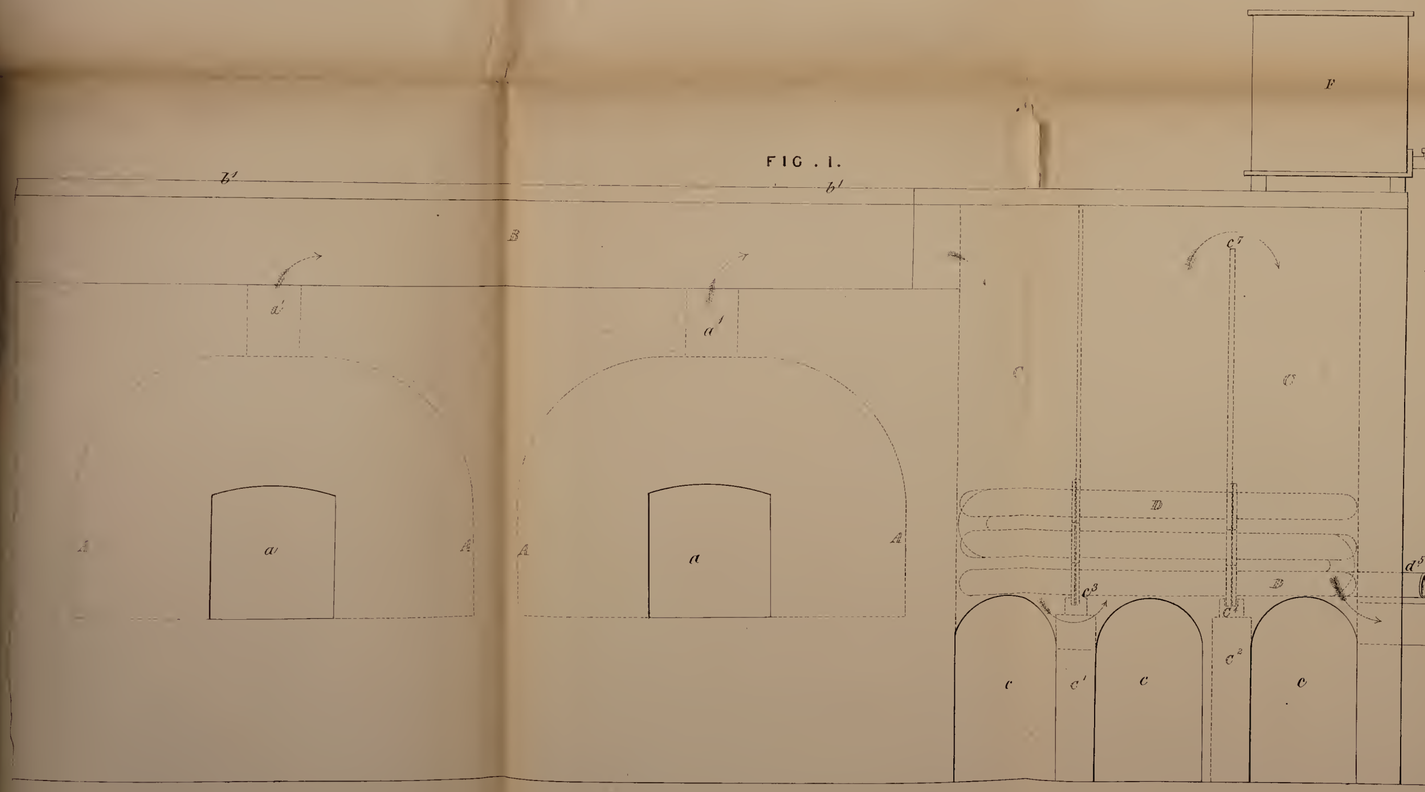


FIG . 4.

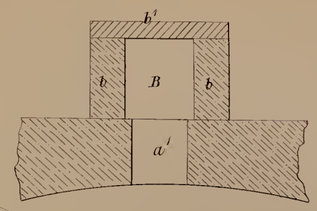
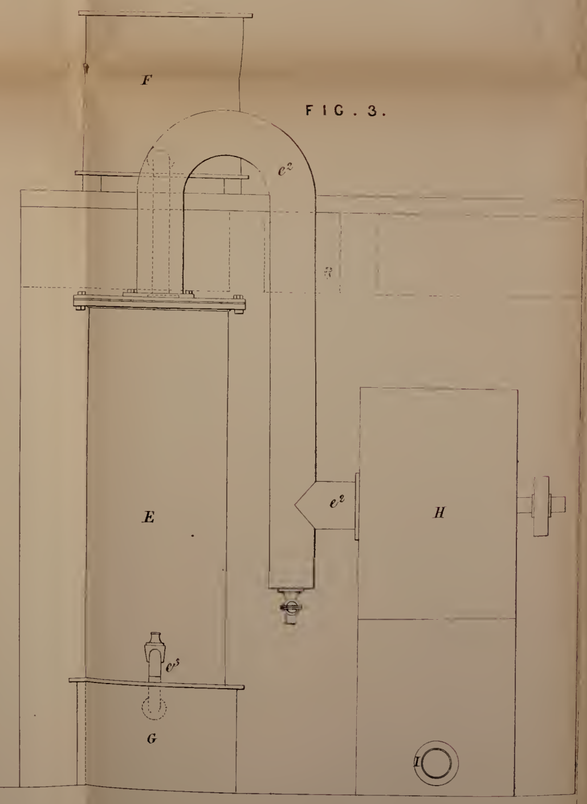


FIG . 3.



The enrolled drawing is colored.

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Drawn on Stone by Malby & Sons

FIG. 7.

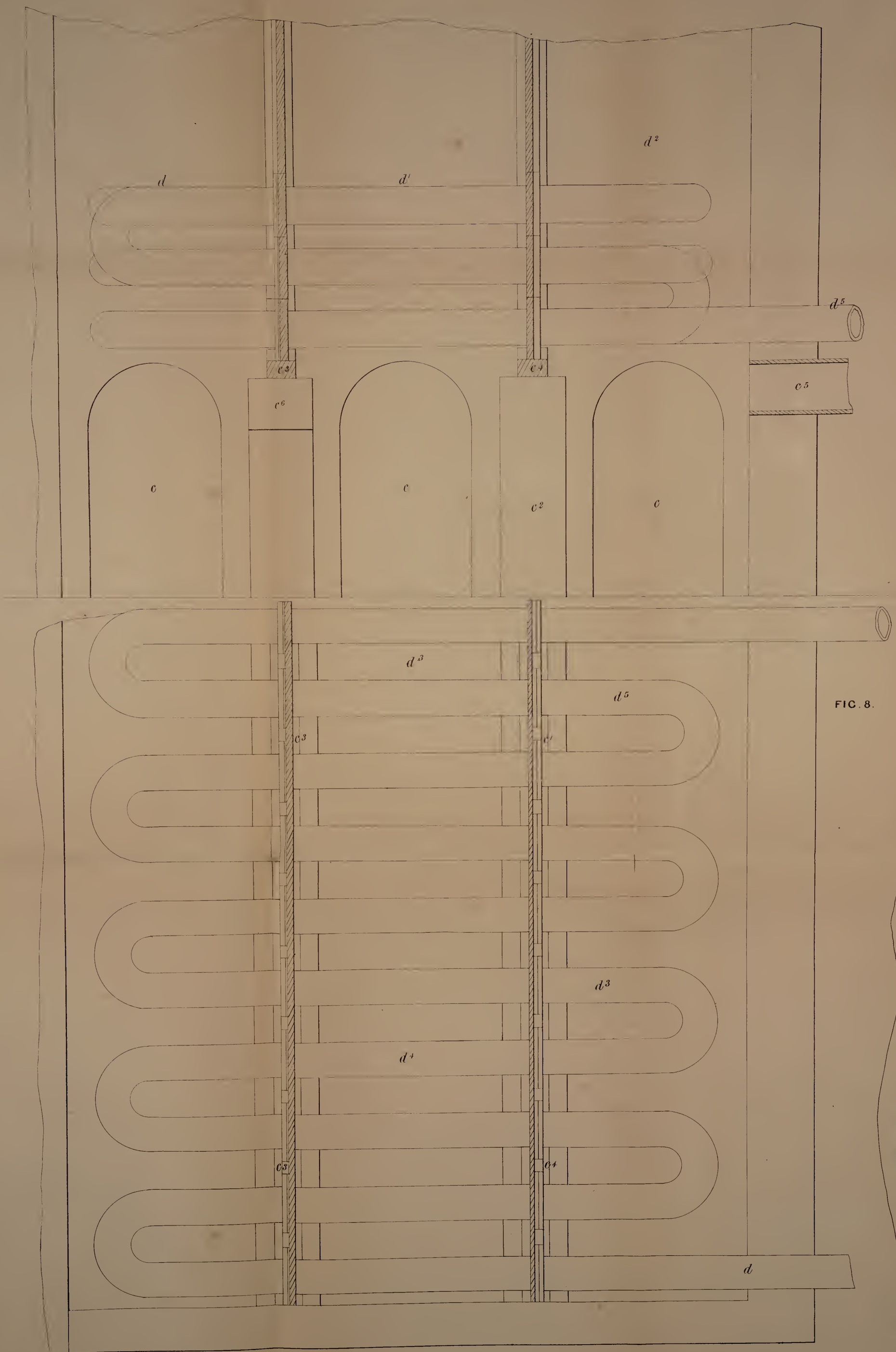
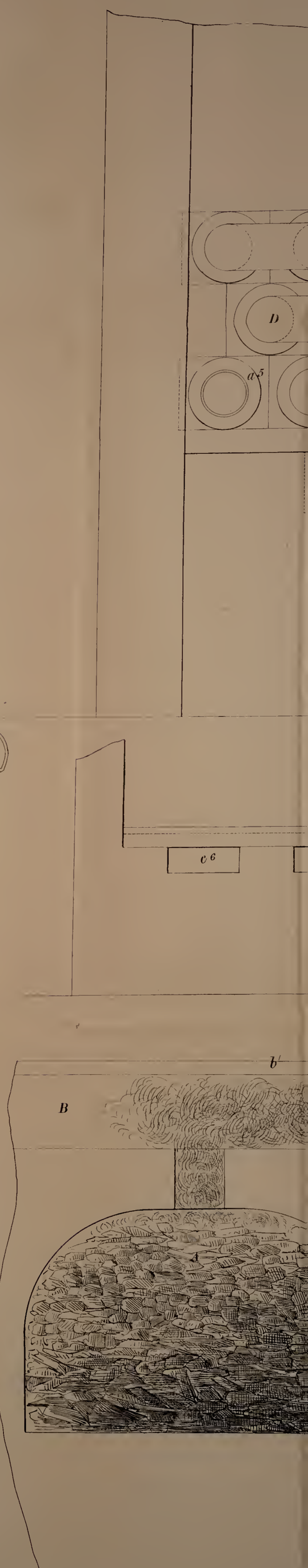


FIG. 8.



The enrolled drawing is colored.

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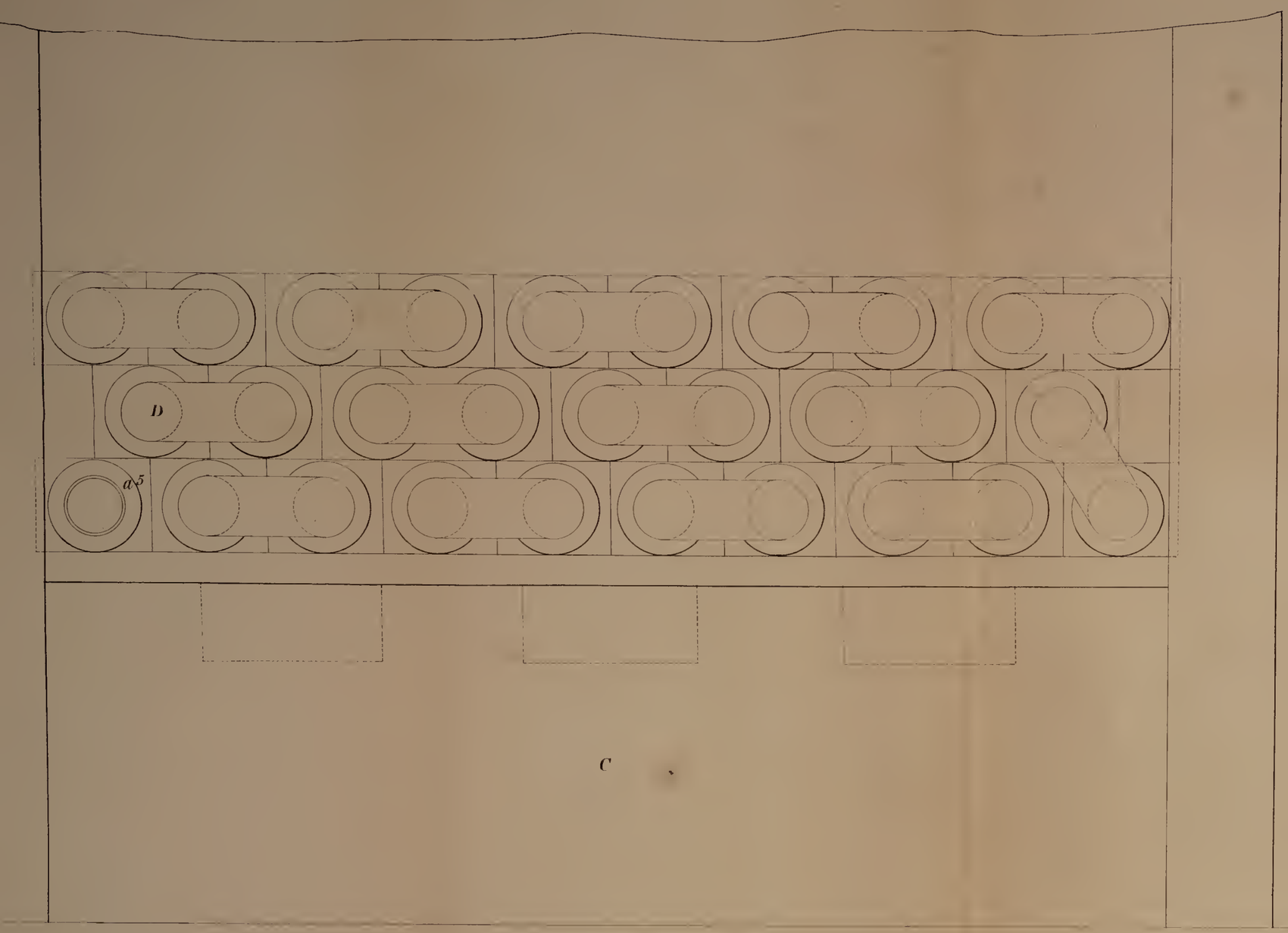

FIG. 5.*

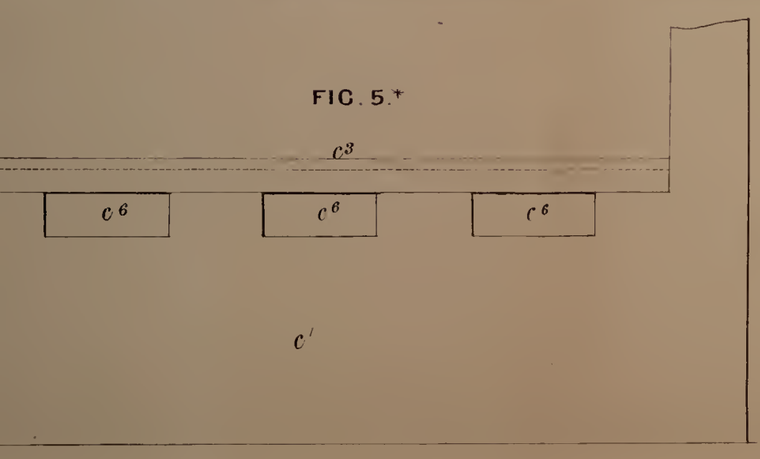

FIG. 5

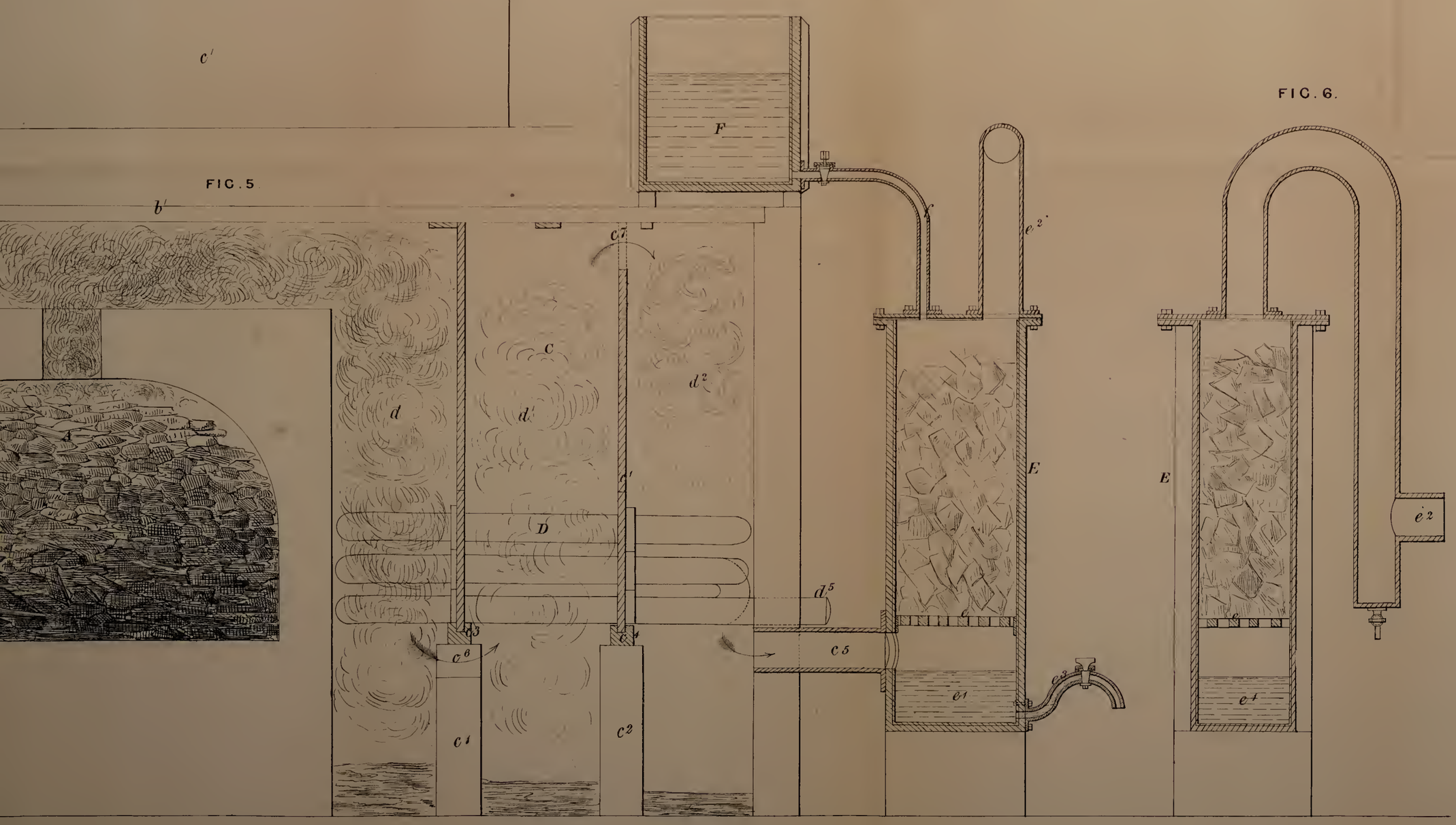

FIG. 6.

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